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Masahiro SAITO
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For: MOBILE COMMUNICATION TERMINAL,
MOBILE COMMUNICATION MANAGING
APPARATUS, MOBILE
COMMUNICATION SYSTEM, COMPUTER
READABLE MEDIUM FOR MOBILE
COMMUNICATION AND MOBILE
COMMUNICATION METHOD

Art Unit: 4154
Examiner: Joseph E. Dean,
Jr.

TRANSMITTAL OF VERIFIED TRANSLATION OF
PRIORITY DOCUMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

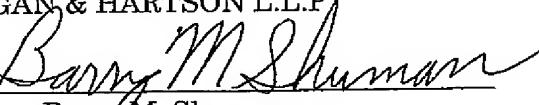
Enclosed herewith is a copy of the verified English translation of priority document Japanese Patent Application No. 2003-369163, filed October 29, 2003, from which priority is claimed.

Acknowledgment of the priority document(s) is respectfully requested to ensure that the subject information appears on the printed patent.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: March 25, 2009

By: 
Barry M. Shuman
Registration No. 50,220

1999 Avenue of the Stars, Suite 1400
Los Angeles, California 90067
Phone: (310) 785-4600
Fax: (310) 785-4601

STATEMENT

I, Kei NAKATSUJI, of c/o NGB CORPORATION, Toranomon East Bldg. 7-13, Nishi-Shinbashi 1-chome, Minato-ku, Tokyo 105-8408 Japan, hereby state that I have a thorough knowledge of the English and Japanese languages and that the attached document is an accurate English translation of the Japanese specification of Japanese Patent Application 2003-369163 filed on October 29, 2003, upon which the present application claims a priority.

Declared at Tokyo, Japan

This 2nd day of March, 2009



Kei NAKATSUJI

PATENT OFFICE
Japanese Government

This is to certify that the annexed is a true copy of the
following application as filed with this office.

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[Inventor]

[Address] c/o Kyocera Corporation, Yokohama Office,
1-1, Kagahara 2-chome, Tsuzuki-ku,
Yokohama-shi, Kanagawa

[Name] Masahiro SAITO

[Applicant for Patent]

[Identification Number] 000006633

[Appellation] KYOCERA CORPORATION

[Agent]

[Identification Number] 100105924

[Attorney]

[Name] Sakaki MORISHITA

[Phone number] 03-3461-3687

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[List of Attached Documents]

[Article]	Claims	1 copy
[Article]	Specification	1 copy
[Article]	Drawings	1 copy
[Article]	Abstract	1 copy

[Designation Of Document] Claims

[claim 1]

A mobile communication terminal comprising:

a plurality of communication interfaces;

5 a communication interface selecting section which selects a communication interface for transmitting data from the plurality of communication interfaces;

10 a terminal identification address assigning section which assigns a terminal identification address for identifying the mobile communication terminal to the data;

15 a communication interface identification address assigning section which assigns a communication interface identification address for identifying the communication interface to the data, the communication interface identification address being assigned in correspondence with the selected communication interface; and

20 a transmitting section which transmits the data being assigned with the two kinds of addresses via the selected communication interface.

20

[claim 2]

The mobile communication terminal according to claim 1, further comprising:

25 a radio wave monitoring section which monitors a status of radio wave reception at a current location,

wherein the communication interface selecting section selects the communication interface in accordance with the monitored status of the radio wave reception.

5 [claim 3]

A mobile communication managing apparatus comprising:
a terminal side receiving section which receives data that is assigned with two kinds of addresses including a terminal identification address for identifying a mobile 10 communication terminal and a communication interface identification address for identifying a communication interface of the mobile communication terminal;

an address storing section which stores an address storing table in which the terminal identification address 15 and the communication interface identification address that are assigned to the received data are associated with each other;

an external side transmitting section which transmits the data received by the terminal side receiving section 20 to a certain destination;

an external side receiving section which receives data being assigned with the terminal identification address;

a communication interface specifying section which 25 detects the communication interface identification address

that corresponds to the terminal identification address being assigned to the data received by the external side receiving section based on the address storing table; and
a terminal side transmitting section which transmits
5 the data received by the external side receiving section to the detected communication interface.

[claim 4]

A mobile communication system comprising:
10 a mobile communication terminal including:
a plurality of communication interfaces;
a communication interface selecting section which selects a communication interface for transmitting data from the plurality of communication interfaces;
15 a terminal identification address assigning section which assigns a terminal identification address for identifying the mobile communication terminal to data;
a communication interface identification address assigning section which assigns a communication interface identification address for identifying the communication interface to the data, the communication interface identification address being assigned in correspondence
20 with the selected communication interface; and
a transmitting section which transmits the data
25 being assigned with the two kinds of addresses via the

selected communication interface; and

a mobile communication managing apparatus including:

 a terminal side receiving section which receives
 the data from the mobile communication terminal;

5 an address storing section which stores an
 address storing table in which the terminal identification
 address and the communication interface identification
 address that are assigned to the received data are
 associated with each other;

10 an external side transmitting section which
 transmits the data received by the terminal side receiving
 section to a certain destination;

15 an external side receiving section which
 receives data being assigned with the terminal
 identification address;

20 a communication interface specifying section
 which detects the communication interface identification
 address that corresponds to the terminal identification
 address being assigned to the data received by the
 external side receiving section based on the address
 storing table; and

25 a terminal side transmitting section which
 transmits the data received by the external side receiving
 section to the detected communication interface.

[claim 5]

The mobile communication system according to claim 4,
wherein the mobile communication terminal includes a
switching informing section which transmits a switch
5 information signal to the mobile communication managing
apparatus when the communication interface selecting
section changes the communication interface, the switch
information signal being assigned with the terminal
identification address and a communication interface
10 identification address corresponding to the communication
interface to be newly selected,

the mobile communication managing apparatus includes
a switching signal receiving section which receives the
switch information signal, and

15 the address storing section stores the address
storing table in which the terminal identification address
and the communication interface identification address
that are assigned to the switching signal are associated
with each other.

20

[claim 6]

A program used in a mobile communication terminal,
the program comprising:

25 a communication interface selection function of
selecting a communication interface for transmitting data;

1 a terminal identification address assigning function
2 of assigning a terminal identification address for
3 identifying the mobile communication terminal to the data;

4 a communication interface identification address
5 assigning function of assigning a communication interface
6 identification address for identifying the communication
7 interface to the data, the communication interface
8 identification address being assigned in correspondence
9 with the selected communication interface; and

10 a transmitting function of transmitting the data
11 being assigned with the two kinds of addresses via the
12 selected communication interface.

[claim 7]

15 A program for mobile communication management, the
16 program comprising:

17 a terminal side receiving function of receiving data
18 that is assigned with two kinds of addresses including a
19 terminal identification address for identifying a mobile
20 communication terminal and a communication interface
21 identification address for identifying a communication
22 interface of the mobile communication terminal;

23 an address holding function of storing an address
24 storing table in which the terminal identification address
25 and the communication interface identification address

that are assigned to the received data are associated with each other;

an external side transmitting function of transmitting the data received by the terminal side 5 receiving function to a certain destination;

an external side receiving function of receiving data assigned with the terminal identification address;

a communication interface specifying function of detecting the communication interface identification 10 address that corresponds to the terminal identification address being assigned to the data received by the external side receiving function based on the address storing table; and

a terminal side transmitting function of transmitting 15 the data received by the external side receiving function to the detected communication interface.

[claim 8]

A mobile communication method comprising:

20 selecting a communication interface;

assigning a terminal identification address for identifying a mobile communication terminal to the data;

assigning a communication interface identification 25 address for identifying a communication interface to the data, the communication interface identification address

being assigned in correspondence with the selected communication interface;

storing an address storing table in which the assigned terminal identification address and the assigned 5 communication interface identification address are associated with each other; and

transmitting the data being assigned with the two kinds of addresses to a certain destination.

10 [claim 9]

The mobile communication method according to claim 8, further comprising:

receiving data being assigned with the terminal identification address;

15 detecting the communication interface identification address that corresponds to the terminal identification address for identifying the mobile communication terminal based on the address storing table; and

transmitting the received data to the communication 20 interface corresponding to the detected communication interface identification address.

[Designation Of Document] Specification

[Title Of The Invention] MOBILE COMMUNICATION TERMINAL,
MOBILE COMMUNICATION MANAGING APPARATUS, MOBILE
5 COMMUNICATION SYSTEM, MOBILE COMMUNICATION TERMINAL
PROGRAM, MOBILE COMMUNICATION MANAGEMENT PROGRAM, AND
MOBILE COMMUNICATION METHOD

[Technical Field]

[0001]

10 The present invention relates to a technology for
mobile communication, in particular, to a technology for
allowing a mobile communication terminal having a
plurality of communication interfaces to select a
predetermined communication interface and to perform
15 communication.

[Background Art]

[0002]

In recent years, CDMA 2000 1X-EV DO (hereinafter,
20 referred to as 'EV-DO') system has been developed as a
high-speed wireless communication system of next
generation. The CDMA 2000 1X system, in which the CDMA
One system is extended so as to correspond to a third-
generation system, has been further specialized for data
25 communication to speed up a transmission rate, thereby

constructing the EV-DO system. Here, the term 'EV' stands for 'evolution' and the term 'DO' stands for 'data only'. Generally, a mobile communication system has been built up for a voice call by using a mobile phone, a car-phone, and 5 a personal handy phone system. At present, a data communication system is used for general data communication including a portable computer such as a PDA (Personal Digital Assistance). A wireless communication network which has been connected to a conventional wired 10 telephone network, and of which service area has been rapidly enlarged has become a social infrastructure. Further, a communication band of a wireless communication network such as a wireless LAN (Local Area Network) has been enlarged.

15 [Patent Document 1] JP-A-2002-300644

[Disclosure Of The Invention]

[Problems That The Invention Is To Solve]

[0003]

When a mobile communication terminal belongs to any 20 communication network, the mobile communication terminal is generally assigned with an IP (Internet Protocol) address from an access point or a base station which manages the communication network. The assigned IP address is valid as long as the mobile communication 25 terminal belongs to the communication network. When the

mobile communication terminal belongs to another communication network, the mobile communication terminal is assigned with an IP address valid in the newly belonging communication network.

5 [0004]

Accordingly, in order to perform data transmission from a communication apparatus to a mobile communication terminal, it is necessary to specify a communication network to which the mobile communication terminal as a 10 communication target currently belongs. This is because an IP address for specifying the mobile communication terminal is determined by the communication network to which the mobile communication terminal belongs.

[0005]

15 A communication protocol called as a mobile IP has been designed and put to practical use so as to cope with the problems peculiar to the mobile communication. According to the mobile IP, the communication apparatus can perform communication regardless of the communication 20 network to which the mobile communication terminal to be a destination of data transmission currently belongs.

[0006]

However, the mobile IP is a communication protocol which has been designed based on a single communication 25 interface. Hence, a mobile communication terminal which

has a plurality of communication interfaces for accessing various communication networks such as mobile phones or wireless LANs will be generalized. For example, a mobile communication terminal normally performs communication via 5 a wireless LAN which is a communication network to which the mobile communication terminal belongs. Alternatively, when the mobile communication terminal does not belong to the area of the wireless LAN, the mobile communication terminal may perform communication via a mobile phone 10 network. The mobile IP does not include logic for causing the mobile communication terminal having the plurality of communication interfaces to provide its functions.

[0007]

The invention has been made in consideration of the 15 above-described problems, and it is an object of the invention to provide a technology which allows a mobile communication terminal to select one of a plurality of communication interfaces and to perform mobile communication.

20 [Means For Solving The Problems]

[0008]

A mobile communication terminal of the invention has the plurality of communication interfaces. The mobile communication terminal selects a communication interface 25 for transmitting data from the plurality of communication

interfaces, assigns the terminal identification address for identifying the mobile communication terminal and the communication interface identification address for identifying the selected communication interface to the 5 transmitting data, and transmits the data via the selected communication interface. The mobile communication terminal may select the communication interface in accordance with the monitoring result of the radio wave status of a connectable mobile communication network.

10 [0009]

The mobile communication managing apparatus according to an embodiment of the invention receives the data transmitted from the mobile communication terminal. The mobile communication managing apparatus makes the terminal 15 identification address and the communication interface identification address that are assigned to the data received from the mobile communication terminal associate with each other, and stores them in the address storing table. Then, the mobile communication managing apparatus 20 transmits the data to a communication apparatus of a destination. Further, when reading out the terminal identification address assigned to data received from the communication apparatus, the mobile communication managing apparatus reads out the communication interface 25 identification address corresponding to the terminal

identification address from the address storing table, and transmits the data to the communication interface.

[Advantage Of The Invention]

[0010]

5 According to the invention, there is an advantage in that the mobile communication terminal performs communication by using a plurality of communication interfaces.

[Best Mode For Carrying Out The Invention]

10 [0011]

Prior to a description of the invention, a mobile IP will be first described.

[0012]

Fig. 1 is a block diagram illustrating the structure 15 of the mobile IP. At the time of data transmission from a communication apparatus 500 to a mobile communication terminal 100, a foreign agent 300 and a home agent 400 relay data. The home agent 400 manages a communication network to which the mobile communication terminal 100 20 should originally belong. The home agent 400 assigns an IP address called as a home address to the mobile communication terminal 100. The foreign agent 300 manages a communication network to which the mobile communication terminal 100 currently belongs. The foreign agent 300 25 assigns an IP address called as a care-of address to the

mobile communication terminal 100. Hereinafter, the communication network managed by the home agent 400 is referred to as a 'home network', and the communication network managed by the foreign agent 300 is referred to as 5 a 'foreign network'.

[0013]

First, the mobile communication terminal 100 needs to recognize whether the currently belonging network is a home network or a foreign network. The foreign agent 300 10 sends a message called as an agent advertisement at regular intervals. The mobile communication terminal 100 identifies the belonging communication network by receiving the message. The mobile communication terminal 100 may request the foreign agent 300 for the agent 15 advertisement message.

[0014]

When recognizing that the currently belonging communication network is the foreign network, the mobile communication terminal 100 transmits a message 20 (hereinafter, called as a 'location registration request message') for requesting location registration to the foreign agent 300. The location registration request message includes the home address and the care-of address of the mobile communication terminal 100. The foreign 25 agent 300 then transmits the location registration message

to the home agent 400. The home agent 400 registers the communication network to which the mobile communication terminal 100 currently belongs and the care-of address assigned to the mobile communication terminal 100 based on 5 the location registration request message. The location registration is performed in the same way as described above even when the mobile communication terminal 100 moves and belongs to another foreign network. When the home agent 400 completes the location registration, the 10 home agent 400 informs the mobile communication terminal 100 of the location registration completion via the foreign agent 300. Accordingly, the mobile communication terminal 100 recognizes that the location registration in the home agent 400 is completed. After the above- 15 described preparations are completed, data communication is actually performed.

[0015]

When the communication apparatus 500 transmits data to the mobile communication terminal 100, the 20 communication apparatus 500 transmits the data to the home agent 400 regardless of the communication network to which the mobile communication terminal 100 belongs. That is, when the communication apparatus 500 performs communication with the mobile communication terminal 100, 25 the communication apparatus 500 needs to know the home

address of the mobile communication terminal 100 but does not need to know the care-of address of the mobile communication terminal 100. The home agent 400 detects the communication network to which the mobile communication terminal 100 currently belongs from the location registration data. When the mobile communication terminal 100 belongs to the home network, the home agent 400 transmits the data received from the communication apparatus 500 to the home address to be the destination.

When the mobile communication terminal 100 belongs to the foreign network, the home agent 400 transmits the data received from the communication apparatus 500 to the foreign agent 300 with the care-of address as the destination. Then, the foreign agent 300 transmits the data to the destination of the care-of address.

Accordingly, the data transmitted from the communication apparatus 500 can be correctly received by the mobile communication terminal 100 regardless of the communication network to which the mobile communication terminal 100 belongs. On the other hand, the mobile communication terminal 100 transmits the data to the communication apparatus 500 without passing through the foreign agent 300 or the home agent 400. In case that the communication apparatus 500 is a mobile communication terminal, data is transmitted via the foreign agent 300 or the home agent 400.

400 according to the above-described method.

[0016]

The mobile communication terminal 100 according to an embodiment includes a plurality of communication interfaces. The mobile communication terminal 100 may select a communication interface from various points of view such as strength of a signal received from a wireless communication network or modulation method, communication traffic, communication cost, or effective communication rate. In contrast, the above-described mobile IP does not include a structure for allowing the mobile communication terminal 100 having the plurality of communication interfaces to provide its functions.

[0017]

15 Further, in the mobile IP, when the mobile communication terminal 100 requests the home agent 400 for the location registration, communication data packets may be discarded. In particular, when the communication environment of the communication network becomes worse 20 because of, for example, an increase in traffic or when it takes much time for the location registration, the effect may be increased. At this time, since the communication data packets are discarded, communication efficiency becomes low and a session may be disconnected.

25 [0018]

Fig. 2 is a diagram showing the hardware configuration of the mobile communication system 50 according to an embodiment of the invention. The mobile communication terminal 100 communicates with the 5 communication apparatus 500 via a mobile communication managing apparatus 200. The communication apparatus 500 may be another mobile communication terminal or a fixed communication apparatus which belongs to a predetermined LAN. The mobile communication terminal 100 includes 10 communication interfaces 102a, 102b, and 102c. Hereinafter, sometimes, the communication interfaces 102a, 102b, and 102c are collectively referred to as a 'communication interface 102'. The communication interface 102a may be a communication interface for a 15 predetermined mobile phone. The communication interface 102b may be a communication interface for another mobile phone. The communication interface 102c may be a communication interface for the wireless LAN. Of course, the communication interfaces 102a, 102b, and 102c may be 20 communication interfaces connected to another communication network. Here, concept of the communication interface includes, for example, not only a hardware device such as a LAN card, but also a software module such as a device driver. That is, the communication interface 25 102 includes a device serving as an interface to connect

to a predetermined communication network.

[0019]

The mobile communication terminal 100 is connected to the communication network 108a, 108b, and 108c via the 5 communication interfaces 102. Hereinafter, sometimes, the communication networks 108a, 108b, and 108c are collectively referred to as a 'communication network 108'. The communication network 108a may be a communication area for a predetermined mobile phone. The communication 10 network 108b may be an area for another mobile phone. Further, the communication network 108c may be a predetermined wireless LAN.

[0020]

The mobile communication terminal 100 sets an IP-VPN 15 (Virtual Private Network) to each communication network 108 located between the mobile communication terminal 100 and the mobile communication managing apparatus 200. The mobile communication managing apparatus 200 receives data from the mobile communication terminal 100 via any one of 20 the communication networks 108. The mobile communication terminal 100 provides data with a terminal identification address for identifying the mobile communication terminal 100 and a communication interface identification address 25 for identifying the selected communication interface 102, and transmits the data to the mobile communication

managing apparatus 200. Here, the terminal identification address is not an address determined by the communication network to which the mobile communication terminal 100 belongs but a unique virtual address relative to the 5 mobile communication terminal 100. It is preferable that the terminal identification address can identify the mobile communication terminal 100, but the terminal identification address does not necessarily need to follow a format of the IP address. In contrast, the 10 communication interface identification address is a temporary IP address assigned in the communication network 108 to which the mobile communication terminal 100 belongs for performing communication. When the mobile communication managing apparatus 200 receives data from 15 the mobile communication terminal 100, the mobile communication managing apparatus 200 registers the terminal identification address in association with the communication interface identification address. And then, the mobile communication managing apparatus 200 transmits 20 data to the communication apparatus 500 to be the destination of data via Internet 350. The communication apparatus 500 acquires information regarding an address of the mobile communication terminal 100 from the terminal identification address and the communication interface 25 identification address assigned to the data.

[0021]

In case that the communication apparatus 500 transmits data to the mobile communication terminal 100, the mobile communication managing apparatus 200 relays the 5 communication apparatus 500 and the mobile communication terminal 100. The mobile communication managing apparatus 200 receives the data from the communication apparatus 500 via Internet 350. At this time, the communication apparatus 500 assigns the data with the terminal 10 identification address and the communication interface identification address of the mobile communication terminal 100, and then transmits the data. The mobile communication managing apparatus 200 transmits the data to the communication interface 102 corresponding to the 15 assigned communication interface identification address, of the mobile communication terminal 100 corresponding to the terminal identification address.

[0022]

Fig. 3 is a schematic diagram illustrating a state in 20 which the communication interface 102 is switched in accordance with a movement of the mobile communication terminal 100. Fig. 3 shows a case where the mobile communication terminal 100 starts from a point A, passes through points B, C, and D, and reaches a point E. In Fig. 25 3, a circle represents a communication area covered by

each communication network 108. Here, the communication area represented by the same reference numeral is a communication area of the same communication medium. A first communication area 408 is a communication area of a 5 predetermined mobile phone company. A second communication area 402 is a communication area of another mobile phone company. A third communication area 404 is a communication area covered by a predetermined wireless LAN. A fourth communication area 406 is a communication area of 10 a personal hand phone system of a predetermined personal mobile phone company.

[0023]

When the mobile communication terminal 100 is located at the point A, the mobile communication terminal 100 15 performs communication via the first communication area 408. When the mobile communication terminal 100 is located at the point B, the mobile communication terminal 100 can perform communication via both the first communication area 408 and the third communication area 20 404. The mobile communication terminal 100 selects the communication interface 102 corresponding to the first communication area 408 or the third communication area 404 in consideration of a receive status of a radio wave or 25 communication traffic. When the mobile communication terminal 100 is located at the point C, the mobile

communication terminal 100 can perform communication via the first communication area 408, the third communication area 404, and the fourth communication area 406. When the mobile communication terminal 100 is located at the point 5 D, the mobile communication terminal 100 can perform communication via the first communication area 408 and the fourth communication area 406. When the mobile communication terminal 100 is located at the point E, the mobile communication terminal 100 performs communication 10 via only the first communication area 408. When the mobile communication terminal 100 selects a desired communication network 108 for communication, an effective communication interface identification address is assigned 15 to the mobile communication terminal 100 by the communication network 108.

[0024]

Further, when the mobile communication terminal 100 performs communication at the point C via the third communication area 404, the mobile communication terminal 20 100 selects the communication interface 102 corresponding to the third communication area 404. When the mobile communication terminal 100 moves to the point D, the mobile communication terminal 100 selects the communication interface 102 corresponding to the first 25 communication area 408 or the fourth communication area

406. The mobile communication terminal 100 transmits the data assigned with the terminal identification address and the communication interface identification address to the predetermined communication apparatus 500 via the selected 5 communication interface 102. In addition, when the mobile communication terminal 100 performs communication at the point C via the third communication area 404, the mobile communication terminal 100 may perform communication by switching to communication via the first communication 10 area 408. This is because that, for example, the communication traffic of the third communication area 404 may increase or the status such that the throughput of the communication via the first communication area 408 may become better. At this time, the mobile communication 15 terminal 100 informs the mobile communication managing apparatus 200 of a switching signal for informing communication switching via the third communication area 404 and selects the communication interface 102 corresponding to the first communication area 408. 20 Accordingly, the mobile communication managing apparatus 200 can properly recognize the communication interface 102 through which the mobile communication terminal 100 performs communication.

[0025]

25 Fig. 4 is a functional block diagram of the mobile

communication terminal 100. Respective parts of the mobile communication terminal 100 and the mobile communication managing apparatus 200, which will be described below with reference to Fig. 5 is implemented by 5 an arbitrary combination of hardware and software of a CPU of an arbitrary computer, a memory, a program for implementing the parts of Fig. 4, the program being loaded on the memory, a memory unit such as a hard disk for storing the program, and a network access interface. 10 Various modification of a method for implementing the parts of the mobile communication terminal 100 and various modification of the device can be made as a skilled person recognizes. The following drawings described below shows blocks based on functions, not the configuration based on 15 hardware.

[0026]

The mobile communication terminal 100 includes a communication section 120, an address processing section 132, a radio wave monitoring section 134, a storing 20 section 130, and a user interface processing section 140. The storing section 130 includes a data storing section 138 and an address storing section 136. The data storing section 138 stores general data to be communicated. The communication section 120 performs a communication 25 processing with the mobile communication managing

apparatus 200. The communication section 120 has a switching informing section 122 and a communication interface selecting section 124. The switching informing section 122 informs the mobile communication managing apparatus 200 of the switching signal described above. The communication interface selecting section 124 selects a communication interface 102 for communication. The communication section 120 acquires the communication interface identification address from the communication network 108 via the communication interface 102 selected by the communication interface selecting section 124. The communication section 120 stores the acquired communication interface identification address in the address storing section 136. The address processing section 132 performs processing regarding an address to be assigned to communication data. When the communication section 120 transmits data to the mobile communication managing apparatus 200, the address processing section 132 assigns the data with the terminal identification address and the communication interface identification address. At this time, the address processing section 132 acquires the terminal identification address and the communication interface identification address from the address storing section 136. The radio wave monitoring section 134 monitors a receive status of a radio wave in the

communication networks 108 which the mobile communication terminal 100 can access. The communication interface selecting section 124 may select the communication interface 102 in accordance with the receive status of the 5 radio wave detected by the radio wave monitoring section 134. The user interface processing section 140 performs an input/output process with a user. The user may select the communication interface 102 via the user interface processing section 140.

10 [0027]

Fig. 5 is a functional block diagram of the mobile communication managing apparatus 200. The mobile communication managing apparatus 200 has a communication section 210, an address processing section 220, and an 15 address storing section 230. The communication section 210 performs a communication processing with the mobile communication terminal 100. The communication section 210 has a switching signal receiving section 212 and a communication network selecting section 214. The 20 switching signal receiving section 212 receives the switching signal from the communication interface selecting section 124 of the mobile communication terminal 100. The communication network selecting section 214 selects the communication network 108 to transmit data to 25 the mobile communication terminal 100. The terminal

identification address and the communication interface identification address are assigned to the data received by the communication section 210 from the mobile communication terminal 100. When the communication section 210 receives the data from the mobile communication terminal 100, the communication section 210 makes the terminal identification address associate with the communication interface identification address, and stores them in the address storing section 230. When the communication section 210 receives the data addressed to the predetermined mobile communication terminal 100 from the communication apparatus 500, the address processing section 220 reads out the communication interface identification address corresponding to the terminal identification address of the mobile communication terminal 100 from the address storing section 230. The communication network selecting section 214 selects the communication network 108 corresponding to the read communication interface identification address and selects a communication interface in accordance with the selected communication network 108. The communication section 210 transmits data via the communication network 108.

[0028]

Fig. 6 is a diagram showing the data structure stored in the address storing section 136. A terminal number

field 232 indicates an ID number for identifying the mobile communication terminal 100. A terminal identification address field 234 indicates the terminal identification address of the mobile communication terminal 100. A first communication interface identification address field 236, a second communication interface identification address field 238, and a third communication interface identification address field 240 indicate the communication interface identification addresses corresponding to the plurality of communication interfaces of the mobile communication terminal 100, respectively. In the mobile communication terminal 100 indicated by a terminal number '1', the terminal identification address '10.1.1.1' is set. The terminal identification address is not modified even though the mobile communication terminal 100 accesses any other communication networks 108, that is, the terminal identification address is a unique address for every mobile communication terminal 100. In the mobile communication terminal 100 indicated by the terminal number '1', a communication interface identification address '168.1.1.6' is set to one of the communication interfaces 102. In the same manner, a communication interface identification address '133.1.1.1' is set to another additional communication interface 102 and a

communication interface identification address '192.1.1.1' is set to still another additional communication interface 102. The communication interface identification address, for example, as described with reference to Fig. 3, is an 5 effective address for every communication network 108 which the mobile communication terminal 100 can access. Although the mobile communication terminal 100 indicated by the terminal number '1' includes three communication interface identification addresses, only one of the 10 communication interface identification addresses is actually used during communication. On the other hand, the mobile communication terminal 100 indicated by a terminal number '3' uses a communication interface identification address '168.1.1.3' or a communication 15 interface identification address '192.1.1.3'. The mobile communication terminal 100 indicated by the terminal number '3' cannot use the communication interface 102 corresponding to the second communication interface identification address field 238. This is because, in the 20 mobile communication terminal 100 indicated by the terminal number '3', the communication interface 102 corresponding to the second communication interface identification address field 238 is not valid at a current location.

25 [0029]

Fig. 7 is a timing chart illustrating a data transmission process to the communication apparatus 500 from the mobile communication terminal 100 and a data transmission process from the communication apparatus 500 to the mobile communication terminal 100. First, the radio wave monitoring section 134 of the mobile communication terminal 100 detects the receive status of the radio wave (S10). The communication interface selecting section 124 selects the communication interface 102 in accordance with the detected receive status of the radio wave (S12). The communication section 120 assigns transmission data with the terminal identification address and the communication interface identification address, and transmits the data to the mobile communication managing apparatus 200 (S14).

[0030]

The mobile communication managing apparatus 200 reads out the terminal identification address and the communication interface identification address assigned to the received data, makes the addresses associate with each other, and stores them to the address storing section 136 (S16). The mobile communication terminal 100 transmits the received data to the communication apparatus 500 to be the destination of the received data (S18).

25 [0031]

When the communication apparatus 500 transmits data to the mobile communication terminal 100, the communication apparatus 500 recognizes the terminal identification address and the communication interface identification address of the mobile communication terminal 100 based on the data received from the mobile communication managing apparatus 200. The communication apparatus 500 transmits the data to the mobile communication managing apparatus 200 (S20). The terminal identification address and the communication interface identification address of the mobile communication terminal 100 to be the destination of the data are assigned to the data. The mobile communication managing apparatus 200 reads out the communication interface identification address from the mobile communication managing apparatus 200 based on the terminal identification address of the destination assigned to the received data, and specifies the communication interface 102 of the transmission destination (S22). The mobile communication managing apparatus 200 transmits the data to the mobile communication terminal 100 (S24). The mobile communication terminal 100 receives the data via the communication interface 102.

25 [0032]

As described above, according to the embodiment, the mobile communication terminal 100 can perform IP communication by switching a plurality of communication systems. Even when the communication network to which the 5 mobile communication terminal 100 belongs changes, the communication network is smoothly switched by the assignment of a new IP address. For example, as described above, in the mobile IP, when the mobile communication terminal 100 changes the communication network, the mobile 10 communication terminal 100 needs to request the location registration to the home agent 400. However, according to the embodiment, since the mobile communication terminal 100 can control switching to another communication network during an idle communication period even while the mobile 15 communication terminal 100 performs communication via the predetermined communication network, a smooth handover can be realized. In addition, since the plurality of communication networks are used, communication options are increased, and communication which does not depend on a 20 predetermined communication service provider can be realized. In addition, when the communication apparatus 500 requests the mobile communication terminal 100 for an ARP (address resolution protocol), the mobile communication management terminal 200 may substitute for 25 the mobile communication terminal 100 so as to respond to

the communication apparatus 500. In addition, since the mobile communication terminal 100 can develop the terminal identification address which is a virtual address on a higher layer according to the conventional communication 5 technology, there is an advantage in that the number of processes or cost for the development can be reduced. Further, since an IPsec (security architecture for internet protocol) is used for the IP-VPN, IP security can be easily secured.

10 [0033]

Further, since the mobile communication managing apparatus 200 holds a correspondence table for the terminal identification address of the mobile communication terminal 100 and the communication interface 15 identification address, the mobile communication managing apparatus 200 can manage the communication interface 102 used by each mobile communication terminal 100. Since the mobile communication terminal 100 informs the mobile communication managing apparatus 200 that the 20 communication interface 102 is switched during communication, an additional registration operation is not required.

[0034]

As described, the invention has been described with 25 reference to the above-mentioned embodiment, but the

invention is not limited to the above-described embodiment. Various modifications can be used as embodiments according to the invention.

[Brief Description Of The Drawings]

5 [0035]

[Fig. 1] Fig. 1 is a block diagram illustrating a structure of a mobile IP.

[Fig. 2] Fig. 2 is a diagram showing a hardware configuration of a mobile communication system according 10 to an embodiment.

[Fig. 3] Fig. 3 is a schematic diagram illustrating a state in which a communication interface is switched in accordance with a movement of a mobile communication terminal.

15 [Fig. 4] Fig. 4 is a functional block diagram of the mobile communication terminal.

[Fig. 5] Fig. 5 is a functional block diagram of a mobile communication managing apparatus.

20 [Fig. 6] Fig. 6 is a diagram showing a data structure stored in an address storing section of the mobile communication terminal.

25 [Fig. 7] Fig. 7 is a timing chart showing a data transmission process to a communication party from the mobile communication terminal, and a data transmission process from an external communication apparatus to the

mobile communication terminal.

[Description Of The Reference Numerals And Signs]

[0036]

Reference numeral 50 denotes a mobile communication system, reference numeral 100 denotes a mobile communication terminal, reference numeral 102 denotes a communication interface, reference numeral 108 denotes a communication network, reference numeral 120 denotes a communication section, reference numeral 122 denotes a switching informing section, reference numeral 124 denotes a communication interface selecting section, reference numeral 130 denotes a storing section, reference numeral 132 denotes an address processing section, reference numeral 134 denotes a radio wave monitoring section, reference numeral 136 denotes an address storing section, reference numeral 200 denotes a mobile communication managing apparatus, reference numeral 210 denotes a communication section, reference numeral 212 denotes a switching signal receiving section, reference numeral 214 denotes a communication network selecting section, reference numeral 220 denotes an address processing section, and reference numeral 230 denotes an address storing section.

[Designation of Document] Abstract

[Abstract]

[Problem] It is an object of the invention to realize effective communication by a mobile communication terminal
5 having a plurality of communication interfaces.

[Means for Resolution]

When transmitting data, a mobile communication terminal 100 selects a communication interface 102. The mobile communication terminal 100 transmits the data via a
10 communication network 108 corresponding to the selected communication interface 102 to a mobile communication managing apparatus 200. The mobile communication managing apparatus 200 transfers the data to a communication apparatus 500. The mobile communication terminal 100
15 assigns a terminal identification address for uniquely identifying the mobile communication terminal 100 and a communication interface identification address for identifying the communication interface 102 that is valid in the communication network 108 to the transmission data.
20 [selected drawing] Fig. 2

FIG. 1

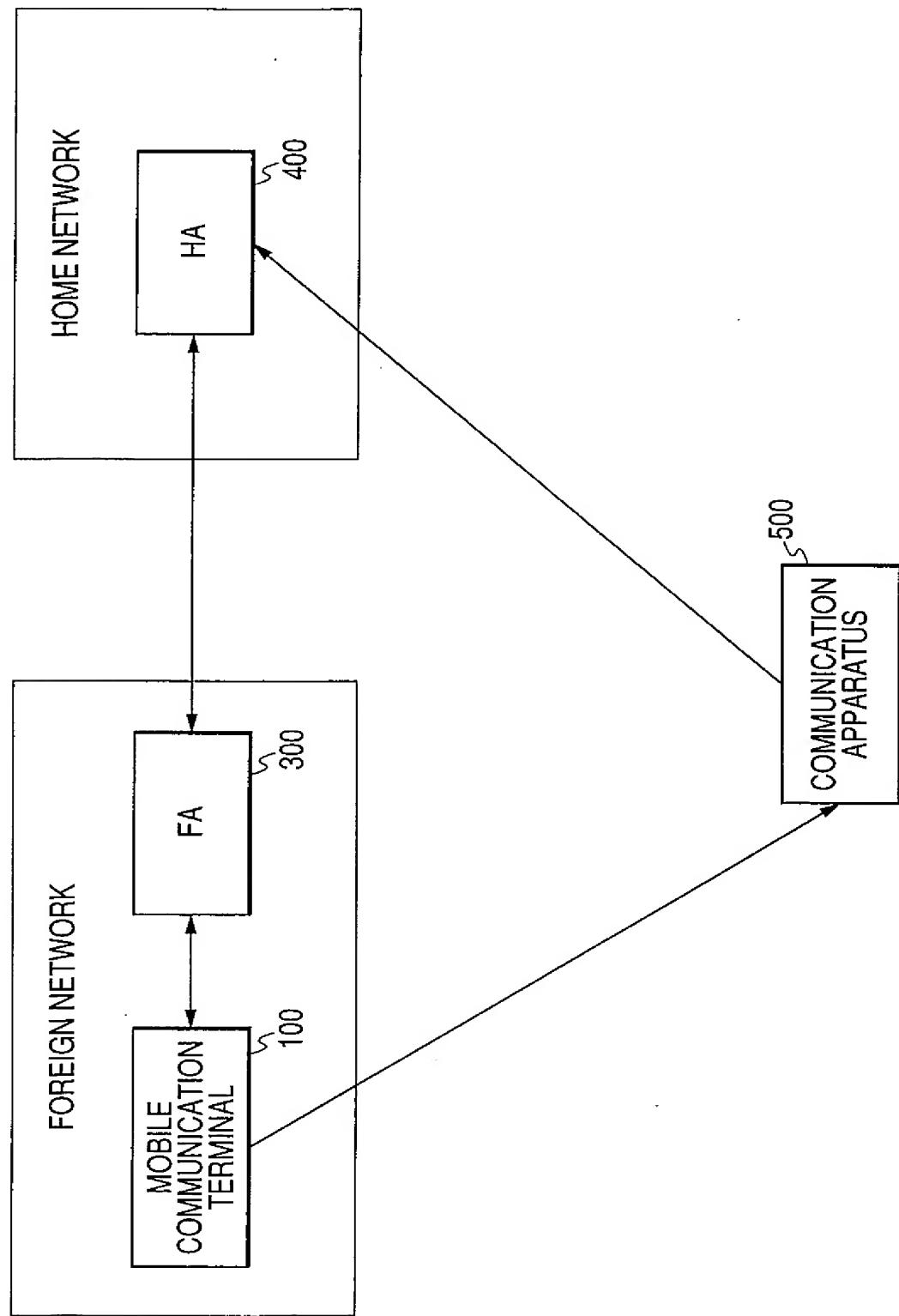


FIG. 2

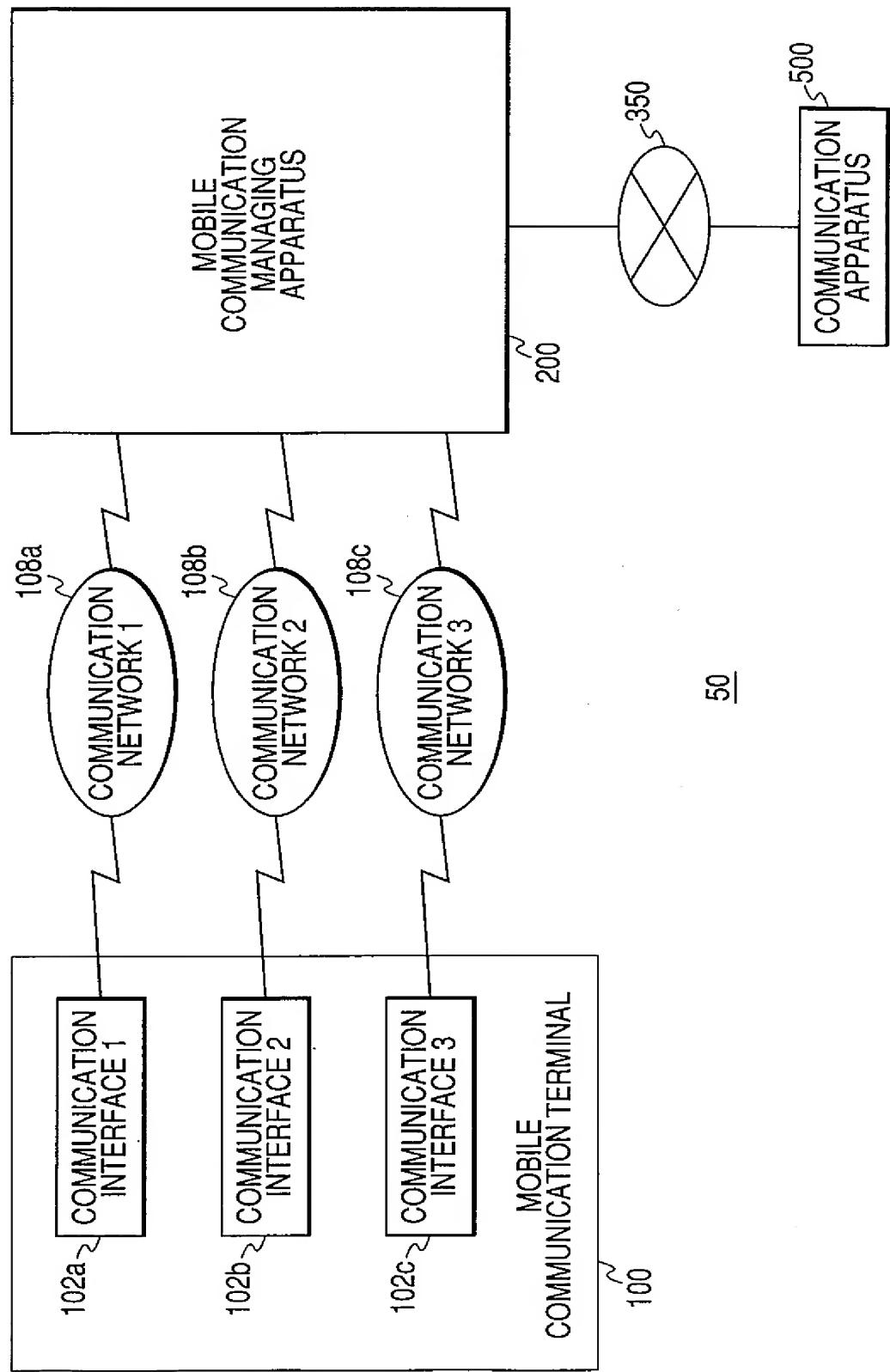


FIG. 3

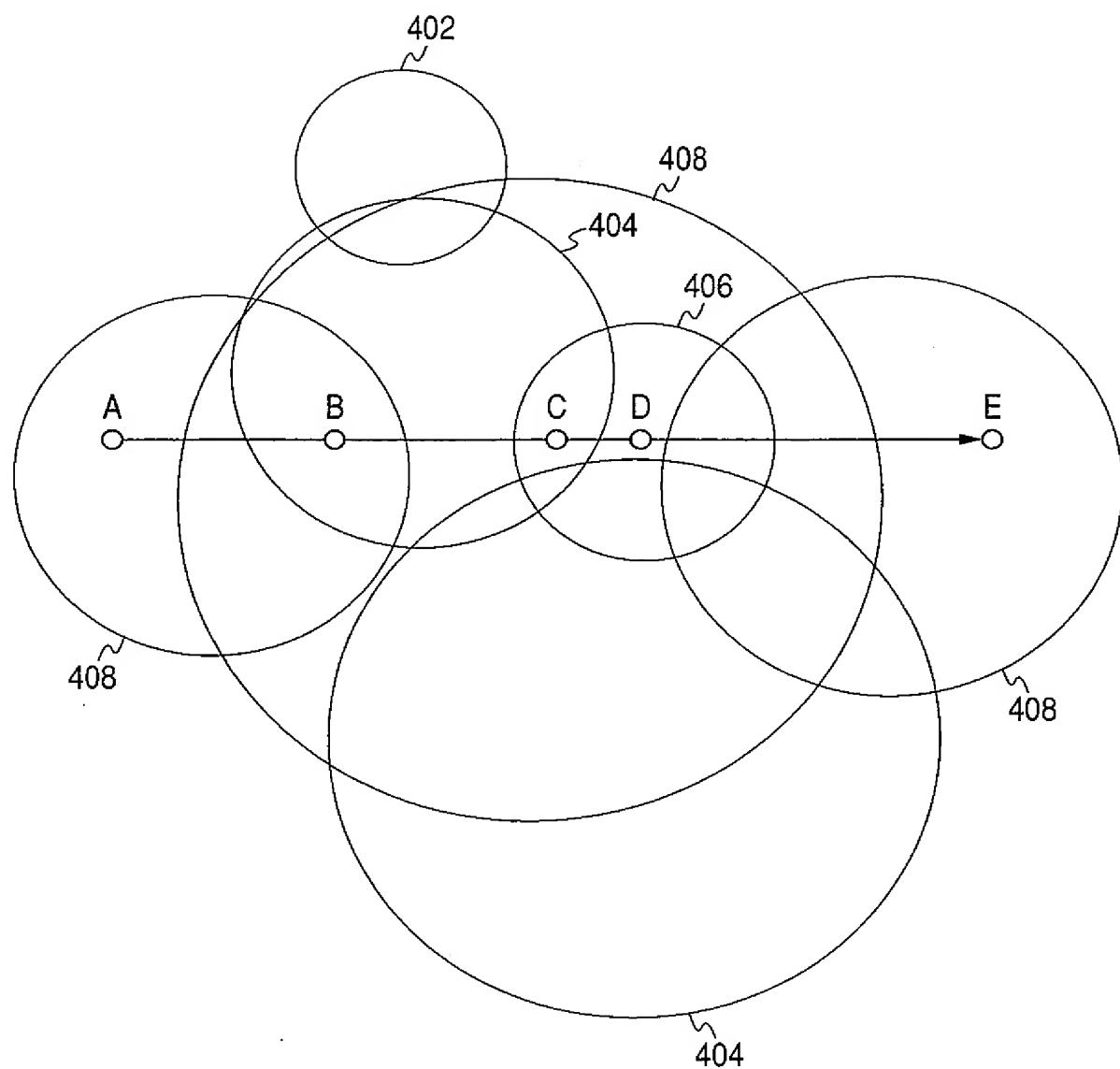


FIG. 4

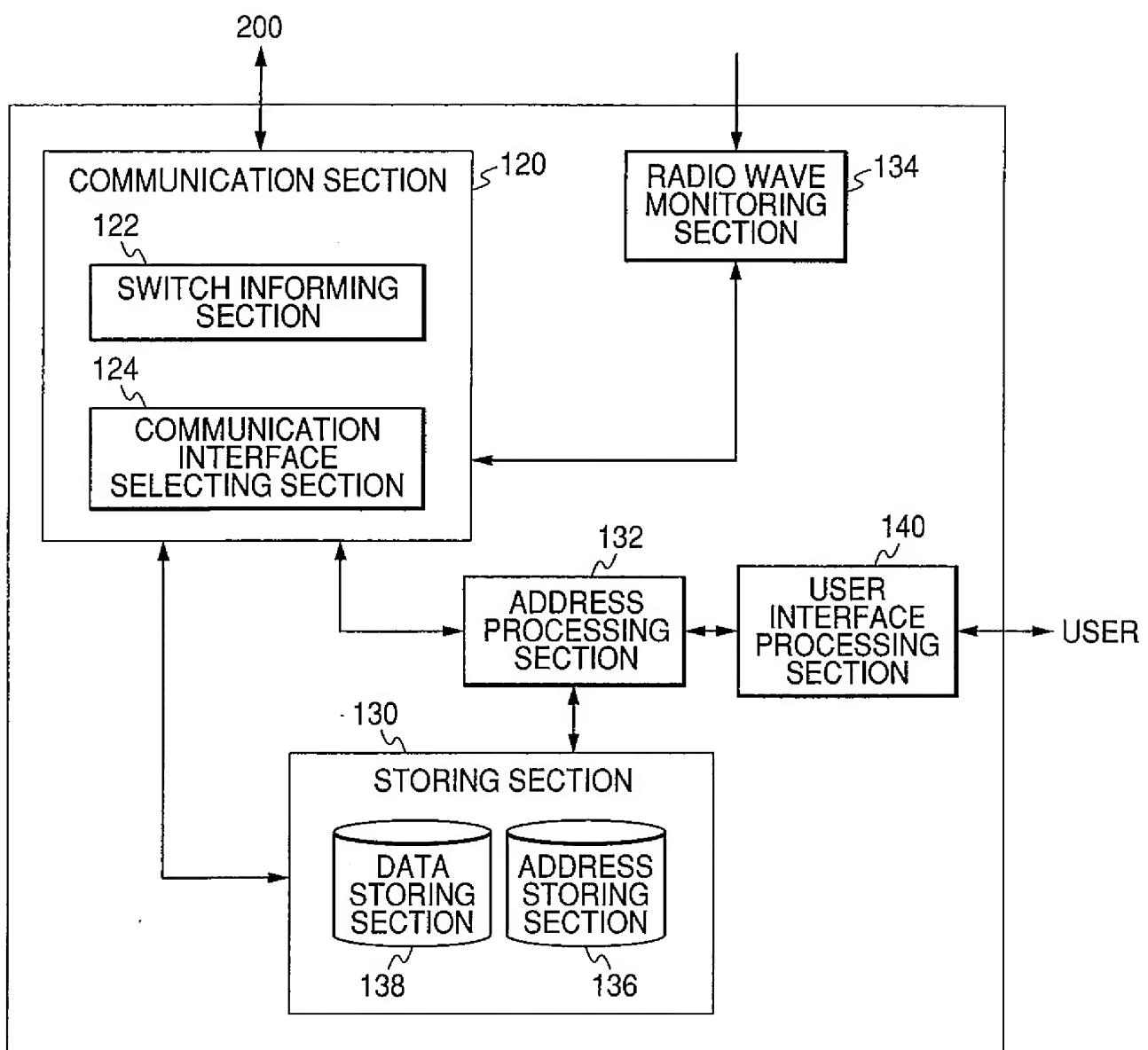


FIG. 5

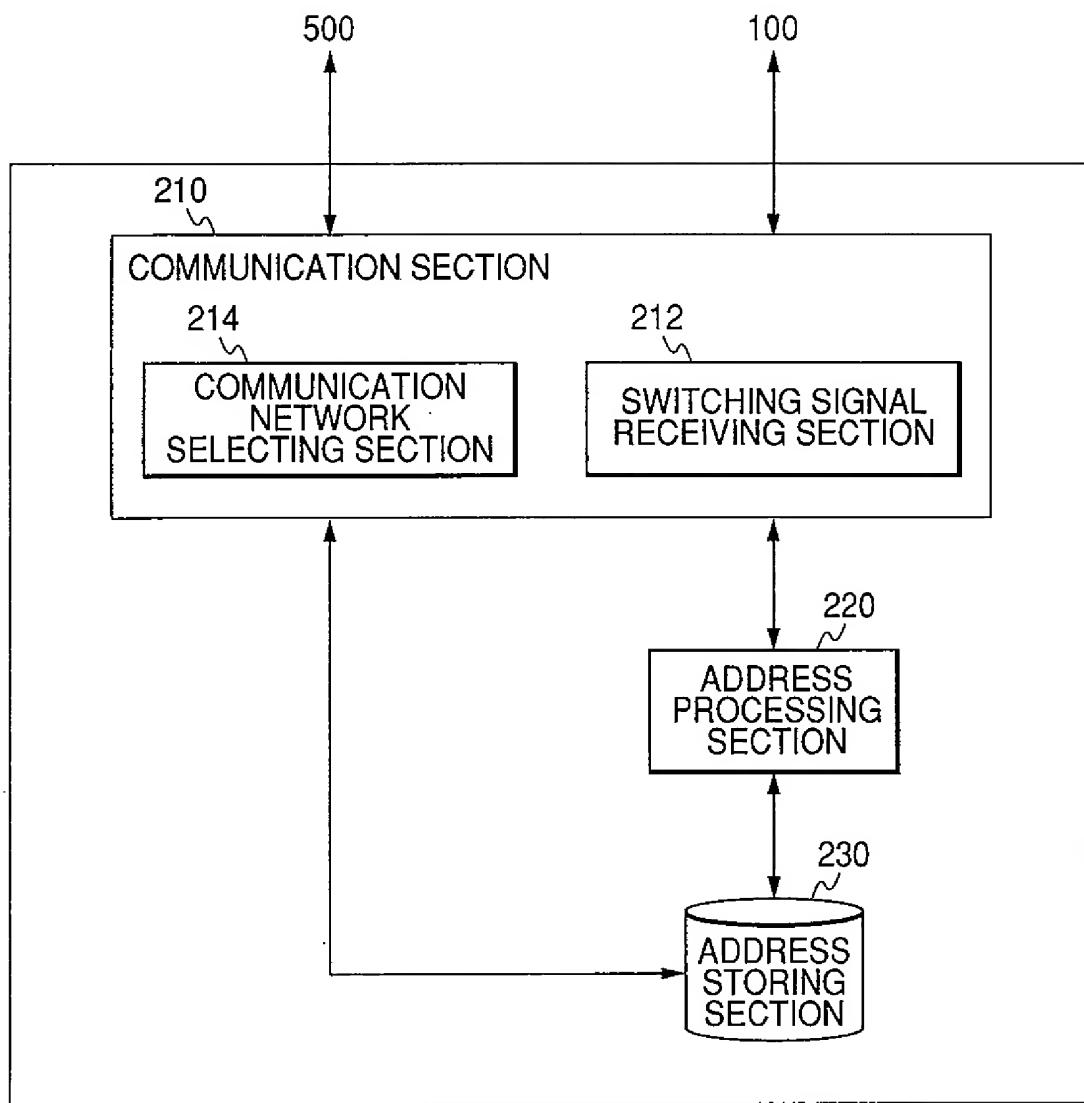


FIG. 6

TERMINAL NUMBER	TERMINAL IDENTIFICATION ADDRESS	COMMUNICATION INTERFACE IDENTIFICATION ADDRESS 1	COMMUNICATION INTERFACE IDENTIFICATION ADDRESS 2	COMMUNICATION INTERFACE IDENTIFICATION ADDRESS 3
1	10.1.1.1	168.1.1.6	133.1.1.1	192.1.1.1
2	10.1.1.2	168.1.1.2	133.1.1.2	192.1.1.2
3	10.1.1.3	168.1.1.3	—	192.1.1.3
4	10.1.1.4	168.1.1.4	133.1.1.4	192.1.1.4
5	10.1.1.5	168.1.1.5	133.1.1.6	—
:	:	:	:	:

FIG. 7

